

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**“Baby brain”: Examining the link between sleep, information processing speed and executive functioning during late stage pregnancy**

A thesis presented in partial fulfilment of the  
requirements for the degree of

Master of Arts (Psychology)

at Massey University, Wellington,  
New Zealand.

**Kathryn Marie Connolly**

**2018**

## **Abstract**

‘Baby brain’ is a term given to the phenomenon experienced by many pregnant women who feel that they have some pregnancy induced cognitive disadvantage. Traditionally the investigation of cognitive deficits during pregnancy has focussed on various subtypes of memory, but researchers have broadened their scope in recent years to include a wide range of cognitive functions.

This thesis considers and expands on the conclusions of recent meta-analyses which suggest that deficits occur in the domains of information processing speed and executive functioning. The current study analyses reported findings in respect of these two cognitive domains, which have been inconsistent across individual studies. Further, the thesis seeks to explore the possible inter-relationship between information processing speed and the planning facet of executive functioning. This additional analysis is based on research with other populations indicating that perceived impairments in executive functioning can be more accurately understood as secondary consequences of impairments in processing speed.

Participants were 133 women from within the Wellington region who were either in the late stages of pregnancy with their first child, or who were not pregnant and had not previously had a child.

Scores on the reaction time measure of processing speed showed an impairment in simple reaction times for pregnant women when compared to non-pregnant controls. The more complex ‘choice reaction time measure’ also showed a trend indicative of impairment during pregnancy, but this did not meet the threshold for statistical significance. There was no measurable difference between pregnant and non-pregnant women on the planning measure of executive functioning.

Deficits in sleep quality and altered mood during pregnancy were considered as potential moderating variables when reviewing scores on cognitive tasks. It was found that while pregnant women had significantly poorer self-reported sleep quality than controls, this did not correlate with cognitive scores. However, anxiety was shown to impact on planning time during the executive functioning task, and on performance during that task.

The results of this research will help to clarify the current inconsistencies in results published in extant literature. It also provides recommendations for further exploration of these cognitive domains during pregnancy.

## **Acknowledgments**

There are many people I need to thank for the completion of this thesis. First and foremost is of course my fabulous supervisor Janet Leathem. I feel very fortunate to have been under her tutelage throughout this project. I would also like to thank my friend and colleague Kate Pennell, for encouraging me to join team ‘baby brain’ in the first instance, and then for all the benefits of team work during the busy months we spent collecting data.

A very special thank you to Professor Emeritus Doug Denney, who not only couriered his computerised cognitive task over to me all the way from Kansas, but who also spent many hours of his time sharing his great wealth of knowledge with me. I am blessed to have crossed paths with such a generous, humorous and insightful person.

Without the help of the many participants in this study, I would have no thesis to write. Thank you to all the women who generously gave up their time to meet with us and complete testing sessions. I was humbled not only by the willingness of women to help, but also by the encouragement and positivity they arrived with, giving me the sense that my investment in this project was meaningful.

Thank you to my amazing network of family and friends who have always believed in me. In the many months that I needed to prioritise my time to meet with participants, so many of you have stepped into the fray - taking my children to and from school, kindergarten and their various afternoon activities. I will be forever grateful.

Thank you to my mum, who arrived for an afternoon every week to look after her grandchildren - and who along with Aunty Jo, paved the way for me many years ago, showing me it was possible to realise your dreams a little later in life, and then to pursue those dreams with fierce determination. To dad, thank you for never faltering in your belief in me, for always being interested, and for always being available at the other end of the phone. To my sister for everything (literally), and my brother for cheering me on from afar.

Finally, the biggest thanks of all to my beautiful family. To my children James, Zara and Sophia, you are the sunshine in my days - I love you endlessly. And of course, to my husband Shaun, without whom this journey would never have begun. Thank you for your love, your patience, your constant encouragement, and for pushing me across the finish line when my energy was waning.

## Table of Contents

<b>Abstract.....</b>	<b>ii</b>
<b>Acknowledgments .....</b>	<b>iv</b>
<b>Table of Contents .....</b>	<b>v</b>
<b>List of Tables .....</b>	<b>vii</b>
<b>List of Figures.....</b>	<b>vii</b>
 <b>Chapter One: Introduction .....</b>	 <b>1</b>
 <b>Chapter Two: Summary of Background Literature .....</b>	 <b>4</b>
Information Processing Speed.....	8
Executive Functioning.....	12
Sleep Quality .....	17
General Issues Pertaining to Research with Pregnant Women .....	20
 <b>Chapter Three: The Current Research .....</b>	 <b>22</b>
Research Context.....	22
Current Research .....	22
Constructs .....	24
Aims .....	25
Research Questions and Hypotheses .....	26
Study Implications.....	26
 <b>Chapter Four: Method .....</b>	 <b>28</b>
Participants .....	28
Data Collection Context .....	34
Measures.....	35
Procedure .....	42
Data Management.....	45
Ethical Approval.....	45

<b>Chapter Five: Results .....</b>	<b>47</b>
Analyses of Cognitive Performance .....	47
Analyses of the Relationship between Processing Speed and Executive Function.....	49
Analyses of Sleep Quality and Mood .....	51
Inter-rater Reliability .....	55
 <b>Chapter Six: Discussion .....</b>	 <b>57</b>
Findings in relation to Processing Speed.....	57
Findings in relation to Executive Functioning .....	59
Interrelationship between Information Processing Speed and Executive Function .....	60
Moderating role of Sleep .....	61
Moderating role of Mood .....	61
Experimenter Effects .....	62
Limitations to the Current Study .....	63
Future Research Opportunities .....	64
Conclusions .....	65
 <b>References .....</b>	 <b>67</b>
 <b>Appendices .....</b>	 <b>76</b>
Appendix A: Information sheets and consent forms .....	76
Appendix B: Cognitive testing administration guidelines.....	81
Appendix C: Guidelines for follow up due to high scores on the DASS-21.....	86

### List of tables

Table 1.	<i>Summary statistics from the 2012 meta-analysis comparing pregnant and non-pregnant women</i>	5
Table 2.	<i>Ethnic composition (%'s) of sample groups with comparative national statistics</i>	32
Table 3.	<i>Numbers of participants tested per examiner</i>	35
Table 4.	<i>Time allowed for participants assigned to the timed condition of the Tower task</i>	39
Table 5.	<i>Cognitive test scores</i>	48
Table 6.	<i>Sleep Quality and Mood Scores</i>	51
Table 7.	<i>Correlation analyses between cognitive performance and sleep and mood</i>	54

### List of figures

<i>Figure 1.</i>	<i>Chart showing gestation of pregnant women at time of testing</i>	29
<i>Figure 2.</i>	<i>Highest level of education</i>	30
<i>Figure 3.</i>	<i>Screen layout for the Tower task</i>	40
<i>Figure 4.</i>	<i>Testing schedule for research participants</i>	43
<i>Figure 5.</i>	<i>Interaction between pregnancy status and time condition on Tower task</i>	50